Exploring the Influence of Visual Saliency on Banner Advertisement within Web Pages

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Introduction

Attention selects stimuli in the environment for our limited capacity working memory. Salient items, those with a unique visual property, have been shown to capture viewers' attention automatically (Theeuwes, 2010). Therefore, salient items ought to receive preferential processing compared with equivalent, but less salient items.

Website designers can use this knowledge to guide users' attention to valuable locations in a webpage. Calculating saliency within simple displays is easy (e.g., the single circle amongst an array of triangles). However, complex displays like webpages require the employment of biologically inspired computational models of visual saliency. For instance, Still and Masciocchi (2010) provided evidence that visual saliency, as determined by a saliency model, guides overt attention within web pages.

In this experiment, we investigated whether saliency influences eye movements and the memorability of banner ads within webpages.

Method

Twenty participants' eye movements were tracked while completing an ambiguous task; asked to answer a *trivia question*. A total of 124 static webpage images were displayed, stemming from a variety of Internet domains. Image order was randomly selected. Surrounding areas of only 36 images containing banner ads were manipulated, making the ad more or less salient than the surrounding area, resulting in 18 High salient and 18 Low salient ads being shown to each participant.

Saliency maps for each webpage were generated per Walther and Koch (2006) <http://www.saliencytoolbox.net> (see Figure 1). Participants' fixation locations (see Figure 2) were collected while they viewed each web page for 8 seconds.

Results

The percent of time participants fixated within the ad region for high (M = 11.83, SD = 6.78) versus low (M = 10.83, SD = 5.32) salient ads did not statistically differ, $t(19) = 1.05$, $p = .31$. In addition, memorability of high (M = 41.67, SD = 15.67) and low (M = 43.6, SD = 14.45) salient ads did not differ, $t(19) = -.65$, $p = .52$.

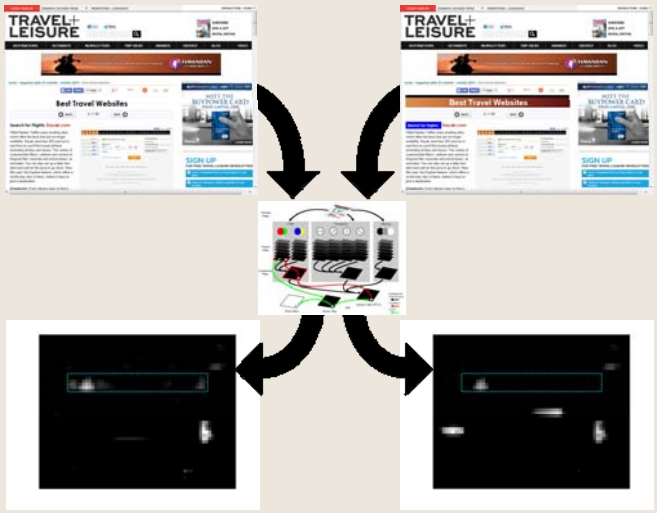

Figure 1. Saliency maps generated using the SaliencyToolbox.

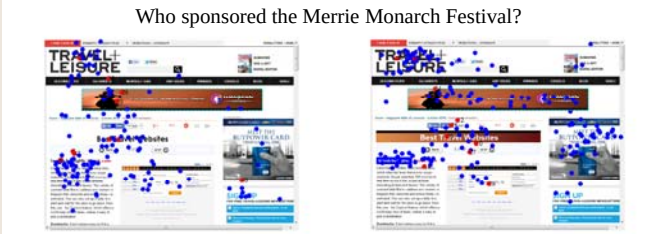

Figure 2. Eye fixation data across participants.

Saliency maps were generated using the Itti, Koch, Niebur (1998) computational model to determine saliency across the entire web pages. An ANOVA with Distribution (observed, shuffled) and Fixation (1-10) as factors examined the saliency values at the fixated locations. Results showed a significant main effect for Distribution, $F(1,19) = 81.69$, $MSE = 18.87$, $p < .001$. The Observed Distribution values being larger than Shuffled Distribution values provides evidence that salient regions within web pages were fixated on more often than expected by chance (see Figure 3). In addition, a significant main effect of Fixations was found, $F(9,171) = 11.97$, $MSE = 4.37$, $p < .001$, as the first fixation values were higher than the later values. However, the interaction between Distribution X Fixation was not significant, $F(9,171) = 1.82$, $MSE = 2.37$, $p = .068$.

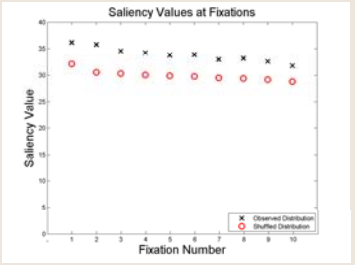

Figure 3. Mean saliency values for the observed ('x') and shuffled ('o') distribution for the first ten fixations.

Discussion

We found a computational model of saliency accounted for overt attention within web pages and did a better job of predicting first fixation over subsequent fixations. These findings replicate Still & Masciocchi's (2010) previous work.

Interestingly, banner ad saliency did not appear to influence overt attention or memorability. We speculate that banner blindness might override the attention influence of visual saliency.

References

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